11-28-00

A

[X] Continuation
[ ] Divisional
[ ] CPA

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

JC961 U.S. PTO
11/27/00

JC912 U.S. PTO
09/722810
11/27/00

The Commissioner for Patents
Washington, D.C. 20231

Date: November 27, 2000
Docket No. PHA 23,944X
Prior Art Unit 2746'
Prior Ex. S. Nguyen

Sir:

This is a request for filing a:

[ ] continued prosecution application ("CPA") under 37 CFR 1.53(d)

[X] continuing application under 37 CFR 1.53(b)

of pending prior application Serial No. 08/914,440, filed on August 19, 1997 of Bernard F. Bareis, Peter J. Foster, and Thomas B. Schalk for SPEECH RECOGNITION SYSTEM FOR ELECTRONIC SWITCHES IN A NON-WIRELINE COMMUNICATIONS NETWORK.

[X] Enclosed are copies of 34 sheets of specification and 12 drawing sheets (all of which constitutes the specification and drawing in this application) and the Declaration and Power of Attorney as filed in the parent application.

[X] Amend the specification by inserting before the first line as a centered heading: --Cross Reference To Related Applications--; and insert below that as a new paragraph --This is a continuation of application Serial No. 08/914,440, filed August 19, 1997.--

[X] An appointment of associates is enclosed.

[ ] As last amended, the title has been changed to

[ ] As last amended, the name of applicant(s) has changed to

[X] Before calculating the filing fee, cancel in this application original claims 2-9.

[X] The filing fee is calculated below:

CLAIMS AS FILED IN THIS APPLICATION					
For	Number Filed	Number Extra	Rate	Basic fee	$710
Total Claims	-20 =	X $18	=		
Independ. Claims	- 3 =	X $78	=		
Mult. Dependent Claims, if any ($260)			=		
Total Filing Fee----------					$ 710.00

[X] Please charge the filing fee calculated above, plus any additional fees which may be required except for the Issue Fee, or credit any overpayment to Deposit Account No. 14-1270.

s:\pi\ma27pic0.wa0.doc

[ ] Priority of application Serial No. *, filed on * in *, is claimed under 35 U.S.C. 119.

[ ] The certified copy of the priority application was filed in prior application Serial No. *.

[X] This application is assigned to Philips Electronics North America Corporation by way of the assignment filed in application Serial No. 09/914,440.

[X] Address all future communications to Corporate Patent Counsel, U.S. Philips Corporation, 580 White Plains Road, Tarrytown, New York 10591.

[ ] A preliminary amendment to this application is enclosed.

[ ] Enter in this application the amendment under 37 C.F.R. 1.116 which was unentered in the prior application.

[ ] An Information Disclosure Statement is enclosed.

[X] An Authorization Pursuant to 37 CFR 1.136(a)(3) is enclosed.

[X] Request Under 37 CFR 3.73 to Proceed in the Name of Assignee and Power of Attorney.

Tony E. Piotrowski
Registration No. 42,080
(914) 333-9609
U.S. Philips Corporation
580 White Plains Road
Tarrytown, New York 10591

CERTIFICATE OF EXPRESS MAILING

Express Mail Mailing Label No. EL458218648
Date of Deposit November 27, 2000

I hereby certify that this paper and/or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 C.F.R. 1.10 on the date indicated above and is addressed to the Commissioner of Patents and Trademarks, Washington, D.C. 20231.

Elissa DeLuccy
Typed Name

Elissa DeLuccy
Signature

SPEECH RECOGNITION SYSTEM FOR ELECTRONIC SWITCHES IN A NON-WIRELINE COMMUNICATIONS NETWORK

CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation of copending application U.S. Serial No. 07/867,873 filed April 13, 1992, now U.S. Patent No. 5,297,183.

TECHNICAL FIELD

This invention is related to telecommunications systems, and more particularly to an electronic digital signal processor-controlled telecommunications system for the recognition of spoken commands and for the directing of telephone calls based on spoken commands.

BACKGROUND OF THE INVENTION

It is well-known that many of the safety hazards of cellular telephone use could be alleviated by utilizing automatic speech recognition. While telephone-based speech recognition systems are known, cellular voice dialing over a mobile telephone exchange ("MTX") presents significant challenges for two basic reasons. First, the recognition technology must accommodate a tremendous range of both remotely-mounted and hand-held microphone types. Second, the signal may be band-limited and degraded in transmission to the MTX where the recognition system will be located. Voice-controlled dialers of the prior art, such as taught in U.S. Patent No. 4,853,953 to Fujisaki, have not been successfully implemented in the cellular environment.

There is therefore a need for voice recognition systems for use in the cellular, satelite and and personal communications network environments that overcome these and other problems of the prior art and that facilitate the use of voice-dialing and other safety and convenience features.

BRIEF SUMMARY OF THE INVENTION

It is therefore an object of the present invention to describe an implementation of a speech recognition system in a cellular or personal communications network environment.

It is a further object of the invention to describe a speech recognition system for use at a mobile telephone exchange (MTX) of a cellular or personal communications network. The placement of the speech recognition system at the MTX significantly reduces cost and increases reliability by enabling the switch vendor to install and maintain the system in conjunction with the cellular switch.

It is another object of the invention to describe a cellular voice dialing system for use in or in conjunction with an MTX of a cellular network.

It is still another object of the invention to use voice recognition techniques to secure access to a cellular or personal communications network.

Another object of the invention is to provide for combined use of speaker-dependent and speaker-independent voice recognition and speaker verification techniques in an MTX of a cellular or personal communications telephone network.

These and other objects of the invention are provided in an advanced system for the recognizing of spoken commands over the cellular telephone or any personal communications (i.e., any non-wireline) network. In the cellular application, for example, a Speech Recognition System interconnects either internally with or as an external peripheral to a cellular telecommunications MTX switch. The Speech Recognition System includes an administrative subsystem, a call processing subsystem, a speaker-dependent recognition subsystem, a speaker-independent recognition subsystem, and a data storage subsystem. The Speech Recognition System also allows for increased efficiency in the cellular telephone network by integrating with the switch or switches as a shared resource. The administrative subsystem of the Speech Recognition System is used to keep statistical logs of pertinent call information. Pre-recorded instructional messages are stored in the memory of the call processing subsystem for instructing a user on his or her progress in using the system. The speaker-independent recognition subsystem allows the user to interact with the system employing non-user specific functions. User specific functions are controlled with the speaker-dependent recognition subsystem. User specific attributes collected by the recognition subsystems are stored in the data storage subsystem.

The foregoing has outlined some of the more pertinent objects of the present invention. These objects should be

construed to be merely illustrative of some of the more prominent features and applications of the invention. Many other beneficial results can be attained by applying the disclosed invention in a different manner or modifying the invention as will be described. Accordingly, other objects and a fuller understanding of the invention may be had by referring to the following Detailed Description of the preferred embodiment.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention and the advantages thereof, reference should be made to the following Detailed Description taken in connection with the accompanying drawings in which:

FIGURE 1 is a block diagram of a cellular telephone network incorporating an external switch-based Speech Recognition System according to the present invention;

FIGURE 2 is a block diagram of a cellular telephone network incorporating an internal switch-based Speech Recognition System;

FIGURE 3 is an upper level block diagram of the Speech Recognition System and data storage subsystem of FIGURE 1;

FIGURE 4 is a detailed component diagram of the speech recognizer board of the Speech Recognition System of FIGURES 2 and 3;

FIGURE 5 is a flowchart showing a Control routine used in the Speech Recognition System;

FIGURE 6 is a flowchart of the Dial routine of the invention used by the subscriber to voice dial a telephone number that has been previously-stored by the subscriber;

FIGURE 7 is a flowchart of the Call routine used by the subscriber to voice dial a speaker-independent telephone number;

FIGURE 8 is a flowchart of the Directory Dialing routine used by the subscriber to recall a previously-stored number using a speaker-dependent directory name;

FIGURE 9 is a flowchart of a Store routine used to store subscriber-specific destination number information;

FIGURE 10 is a flowchart of a Memory routine used to store speed-dial numbers associated with specific memory locations; and

FIGURE 11 is a flowchart of a Directory Storage routine used to store speaker-dependent directory names and associated telephone numbers for use by the subscriber to speed-dial destination numbers based on the associated directory names.

Similar reference characters refer to similar parts or steps throughout the several drawings.

DETAILED DESCRIPTION

FIGURE 1 is a block diagram of a cellular telephone network incorporating an external switch-based Speech Recognition System according to the present invention. Although the following description is specifically related to use of the Speech Recognition System at or in conjunction with

an MTX of a cellular network, it should be appreciated that the System also interconnects either internally with or as an external peripheral to a personal communications network. Indeed, the principles of the invention are applicable to any cellular-like network application, i.e., where a non-wireline communications network is employed for mobile, satelite, portable or personal communications. The Speech Recognition System can also be used as a shared resource through integration with a plurality of such non-wireline communications networks.

Referring now to FIGURE 1, an exemplary telephone network is a cellular network 10 having a mobile telephone exchange (MTX) switch 12 connected to a transceiver and an antenna 14. The transceiver is located in each cell of the cellular network and communicates with the MTX to effect transmission and reception of signals to and from the mobile telephone located in vehicle 15. The transceiver is typically connected to the MTX via a leased or dedicated network line 11. The MTX 12 is typically connected to the land-based destinations via telephone network 16.

A cellular mobile telecommunications system connects mobile telecommunications customers, each having a mobile unit, to land-based customers served by a telephone network. Incoming and outgoing calls are routed through a mobile telecommunications switching office connected to a group of cell sites that communicate with mobile units. The mobile

telecommunications switching office includes a mobile telephone switching exchange (MTX) for routing the calls between the mobile units and the telephone network. In a typically mobile cellular communications system, there are usually many cells per MTX and several MTX's per system. As used herein, "mobile telecommunications system" refers to cellular, satelite and personal communications network environments.

Each cellular telephone is uniquely identified by two numbers: a serial number ("ESN") encoded in the phone by its manufacturer, and a mobile identification number ("MIN"), which is the cellular telephone number programmed in by the cellular service provider. The service provider operates the MTX 12 and keeps a database of all MIN's (and their associated ESN's). Each time a call is placed by the cellular telephone, the service provider verifies whether the MIN and the associated ESN are authorized. If the MIN and ESN of a cellular phone are not recognized (and the area code or NPA of the MIN indicates that the phone number is outside of the provider's service area), the provider normally allows the call to proceed at least one time. If billing authorization cannot later be verified, however, the MIN and serial number are then placed on an exception list. Subsequent attempts to use the MIN will then be rejected.

According to one embodiment of the invention as shown in FIGURE 1, a Speech Recognition System 20 is connected as an

external peripheral to the MTX through a set of preferably digital trunk lines. Set 22 is used for incoming signals and set 24 is used for outgoing signals. Other types of signaling, such as CEPT E1 or analog, may also be used besides T1. The Speech Recognition System 20 is connected to a dedicated data storage subsystem 26 through a data network 28. The data storage subsystem is used to store recognition data derived from the subscribers to the voice dialing service as will be described. The Speech Recognition System 20 may be integrated with one or more switches (whether or not cellular) for use as a shared resource via incoming and outgoing trunk sets 30 and 32.

Referring now to FIGURE 2, a block diagram shows the cellular telephone network 10' with the Speech Recognition System 20 interconnected internally to the MTX. This is the preferred embodiment of the invention. The hierarchical architecture of the cellular switch includes the central processing unit 33, memory 34, data storage disk 35, cellular interface 36, central office trunk interface 37 and a backplane or switching matrix 38.

The Speech Recognition System 20 includes a number of functional subsystems: an administrative subsystem 21, a call processing subsystem 23, a speaker-dependent recognition subsystem 25, a speaker-independent recognition subsystem 27, and the data storage subsystem 29 (which corresponds to the storage system 26 of FIGURE 1). The administrative subsystem

21 of the Speech Recognition System is used to keep statistical logs of pertinent call information. Pre-recorded instructional messages are stored in the memory of the call processing subsystem 23 for instructing a user on his or her progress in using the system. The speaker-independent recognition subsystem 27 allows the user to interact with the system employing non-user specific functions. User specific functions are controlled with the speaker-dependent recognition subsystem 25. User specific attributes collected by the recognition subsystems are stored in the data storage subsystem 29.

FIGURE 3 is an upper level block diagram of the Speech Recognition System of FIGURE 1. The hierarchical architecture of the System 20 comprises a control central processing unit 40, a speech recognizer board 41, a video drive circuit board 42, a disk drive controller board 43 with associated hard disk drive, telephone interface circuit boards 44, and a local area network ("LAN") interface board 45. A local area network 46 connects these components of the System to the data storage subsystem 29, which comprises a LAN interface board 47, a CPU control board 48 and a mass storage hard drive device 49. As also seen in FIGURE 3, a pulse code modulation ("PCM") highway connects the telephone interface boards 44 to the speech recognition board 41. The MTX is also connected to the System 20 through the interface boards 44.

The CPU 40 and associated control programs function as the system administrative subsystem 21 of FIGURE 2. The recognizer board 41 acts as the recognition call processing subsystem 23 and the recognition subsystems 25 and 27. Command and control functions are communicated to the recognizer board 41 from the system administrative processor 40 to the recognition call processing subsystem through a system bus. Responses received by the administrative processor from the recognition subsystem indicate primary and secondary recognition responses, error codes and command acknowledgements.

Referring now to FIGURE 4, a more detailed schematic diagram is shown of the recognizer board 41 of FIGURE 3 and modules 25 and 27 of FIGURE 2. The recognizer includes a control digital signal processor ("DSP") 50 having an associated memory 51 for supporting control programs and data. The control DSP 50 in this embodiment of the invention controls a plurality of speech recognition digital signal processors 52a...52d via a control bus 53. The control DSP 50 also connects to an interface processor 54 via a host port interface 55. Interface processor 54 has its own processor memory 56. A buffer 57 interconnects the interface processor to a system bus interface circuit 58 that interconnects the recognizer board to the system bus.

The PCM highway of FIGURE 3 or backplane of FIGURE 2 is connected to a PCM highway interface circuit 59 that supplies

speech sample information to the control DSP 50 and memory 51 via address and data bases 60 and 61. Each of the speech recognition DSP's 52a...52d has an associated memory 62a...62d and storage buffer 63a...63d. Buffered address and data buses 64 and 65 interconnect to the address and data buses 60 and 61 through the buffers 66.

The interface processor 64 converts batch system commands or command blocks received through the system bus interface 58 into singular commands for the control DSP 50. Similarly, singular responses from the control DSP 50 are buffered by the interface processor 54 and are sent to the administrative processor (of FIGURES 2 and 3) in code blocks to increase overall system efficiency.

All telephone channel signaling and PCM highway sample transfer is handled by the control DSP 50 through the PCM highway interface 59. The control DSP 50 is also used to send samples and commands to the four speech recognition DSP's 52a...52d. Additionally, the DSP's 52 can function to stop outgoing messages based on detection of certain incoming speech energy.

The system data flow is such that recognition commands and responses are sent to and from the administrative processor and the speech recognition DSP's 52 through the control DSP 50, the interface processor 54, and the system bus interface 58. Speech samples are received by the speech

recognition DSP's 52 through the PCM highway interface 59 and the control DSP 50.

The present invention facilitates the implementation of voice-dialing in a cellular telephone or other personal communications network environment. When a user "subscribes" to the service (e.g., with the MTX service provider), it is desirable that certain speech data be collected from the subscriber for security purposes. Thus, upon subscription, the user normally will be asked to provide his or her native language (e.g., English, Spanish, French, etc.), a personal identification number, and personal information related specifically to the subscriber such as a social security number or date of birth. This latter information may be used in an automated query process as will be described to prevent fraudulent use of the cellular or personal telephone network. Once the user information is activated in the system, the user may place or receive telephone calls. Initially, the user will be required to enter speed-dial numbers and their associated directory names.

Referring now to FIGURE 5, a functional flowchart is provided describing the basic control functions of the Speech Recognition System according to the present invention. The routine begins at step 102 when the user dials digits from the cellular telephone. At step 104, a test is performed to determine if a Speech Recognition System access code has been dialed. If not, the cellular switch processes the call based

on the number dialed at step 106 and the routine ends. If the result of the test at step 104 is positive, the routine continues at step 108 during which the switch makes an audio path connection between the user and the Speech Recognition System. At step 110, the switch sends the user's mobile identification number ("MIN") to the Speech Recognition System. As noted above, the MIN is a unique number associated with a given cellular telephone that is available to the switch each time a telephone call is placed.

According to the invention, each user who subscribes to the service will have prerecorded a list of destination numbers. At step 110, these speed-dial numbers, along with speaker-dependent templates and user language type data, are retrieved from the data storage subsystem. As noted above, the data storage subsystem stores such data at predetermined locations that are preferably accessed by the MIN. The routine then continues at step 112 with the Speech Recognition System prompting the user that it is "Ready For Command" or the like. The command is made in the language as determined by the user language type data retrieved at step 110. At step 114, the Speech Recognition Systems engages the speaker-independent recognition subsystem to obtain the user response. Depending on the response, one of several different subroutines follow.

If the user states and the system recognizes a "Dial" command, control is passed to the Dial Routine of FIGURE 6.

In particular, a test is made at step 116 to determine if the Dial command is recognized. If so, control is transferred to the routine of FIGURE 6. If the response to the test at step 116 is negative, a test is made at step 118 to determine if a "Call" command has been spoken and recognized. If the system recognizes a "Call" Command, control is passed to the Call Routine of FIGURE 7. If the response to the test at step 118 is negative, a test is made at step 120 to determine if a "Directory" command has been spoken and recognized. If the system recognizes a "Directory" Command, control is passed to the Directory Dialing Routine of FIGURE 8.

If the result of the test at step 120 is negative, a test is made at step 122 to determine if the user has spoken a "Quit" command. If so, the routine terminates. If the result of the test at step 122 is negative, the Speech Recognition System responds with a error message in step 124. A test is then performed at step 126 to determine if a predetermined maximum error count has been reached. If not, control is transferred back to step 114. If the predetermined maximum error count has been reached, the call and the MIN is transferred to an operator at step 128 and the routine ends.

Referring now to FIGURE 6, the Dial Routine is described in detail. At step 130, the Speech Recognition System prompts the user with a message, such as "Phone Number Please," and applies the speaker-independent recognizer to collect the digits. A test is performed at step 132 to determine whether

a digit has been collected. If not, a test is made at step 134 to determine if a predetermined timeout has elapsed. A negative response to the timeout step returns control back to step 132. If the outcome of the test at step 134 is positive, the routine performs a test at step 136 to determine if at least the first digit of the phone number to be called has been entered. If so, another test is performed at step 138 to determine if a maximum error count has been reached. If the outcome of the test at step 138 is negative, the Speech Recognition System prompts the user to "please enter next digit" at step 140 and control returns to step 132.

If, however, the outcome of the test at step 136 is negative, the routine tests to determine whether a maximum error count has been reached at step 142. If not, control returns to step 130 to request the user to enter the phone number. If the outcome of the test at either step 138 or 142 is positive, the call (with the MIN) is transferred to an operator at step 144 and the routine ends.

If the outcome of the test at step 132 is positive, the recognizer preferably responds with a short beep or other audible indication at step 146. A test is then made at step 148 to determine if the digit collected is the last digit expected in the string. If not, the digit is saved in a string buffer at step 149 and the routine returns to step 132 to collect another digit. If, however, the outcome of step 148 is positive, all digits have been collected and the

speaker-independent recognition subsystem is engaged at step 150.

At step 152, the subsystem attempts to verify the called number. If the verification command is not recognized, the Speech Recognition System responds at step 154 with a message such as "Error, Please repeat," and control returns back to step 152. If the outcome of the test at step 152 is positive, the telephone number is repeated to the user at step 156 and the speaker-independent recognition subsystem is engaged.

A test is then made at step 158 to determine whether the user (by spoken command) desires to "Store" the number. If yes, the control is transferred to the Store routine of FIGURE 9. If the outcome of the test at step 158 is negative, a test 162 is made to determine whether the user has spoken (and the recognizer has recognized) a "Send" command. If not, the Speech Recognition System again plays an error message at step 164 and control is returned to step 158. A positive response to the "Send" test made at step 162 transfers the MIN and the string dialed to the switch for outdialing. Such transfer occurs at step 166. At step 168, the switch dials the telephone number and connects the user to the dialed number.

The Call routine is shown in detail in FIGURE 7. The routine begins at step 170 during which the Speech Recognition System responds to the user's "Call" command with a message "Calling." At step 172, the speaker independent recognition subsystem is engaged to obtain the user's response. A test

is then made at step 174 to determine if the user speaks a "Memory" command, indicating that the number to be called is to be stored and made available for speed-dialing once a preferably two digit memory location number is subsequently received. If the outcome of the test at step 174 is positive, the Speech Recognition System queries the user "Which memory" and engages the recognition subsystem at step 176. At step 178, a test is made to determine if a two digit memory location has been identified by the user. If a two digit memory location has not been identified, a timeout test is performed at step 180. If timeout occurs, the Speech Recognition System prompts the user to "Please enter next digit" at step 182 and control is returned to step 178. A negative outcome of the timeout test also returns control back to step 178.

A positive outcome of the test at step 178 indicates that the two digit memory code has been received. The routine then recalls the previously-stored telephone number associated with the memory code at step 184. The Speech Recognition System then notifies issues a "Calling" message to the user at step 186.

A user may also retrieve the stored telephone number by speaking one of the speaker-independent key words. Thus, if the outcome of the test at step 174 is negative, the routine continues at step 187 with the user speaking a valid key word associated with one or more previously-stored telephone

numbers. Without limitation, such key words include HOME, OFFICE, TIME, SECRETARY, FRIEND, WORK and INFORMATION. A test is then made at step 188 to determine if the work spoken is a valid key word. If not, the system responds with an error message at step 190 and asks the user to speak the word again at step 187. A positive outcome to the test at step 188 transfers control to step 186.

At step 192, the speaker-independent subsystem is again engaged to obtain a user command. A test is made at step 194 to determine whether the user desires to "Verify" the number retrieved. If a "Verify" command is spoken and recognized, the stored number associated with the key word is repeated to the user and the recognizer is engaged at step 196. A test is then made at step 198 to determine whether the user desires to "Clear" the number retrieved and start again. If so, the Speech Recognition System responds with a "Ready" message at step 200 and control returns to step 187.

If, however, the outcome of the test at either step 194 or step 198 is negative, a test is made at step 202 to determine if a "Send" command has been spoken and recognized. If not, the system responds with an error message at step 204 and returns to step 192. If the user speaks the "Send" message, the Speech Recognition System responds at step 206 with a "Dialing" message. At step 208, the System transfers the MIN and the telephone number to be dialed to the switch

for outdialing. The switch dials the telephone number and connects the user to the dialed number at step 210.

Referring now to FIGURE 8, a flowchart is shown of the Directory Dialing routine. This routine is called when the user desires to recall and dial some previously-stored telephone numbers using a previously-stored speaker-dependent name. In response to the "Directory" command from the user, the routine plays a message at step 212 to request the name in the directory. Step 212 also engages the speaker-dependent recognition subsystem. A test is then made at step 214 to determine if the name has been collected from the speaker. If no response is obtained, a timeout test is performed at step 216. Failure of the speaker to respond before the end of the timeout causes the issuance of an error message at step 218 and the routine returns to step 214. If the timeout occurs without the speaker's response, control is transferred back to step 212.

A positive outcome of the test at step 214 means that the directory name spoken by the user has been recognized. The routine then continues at step 220 and recalls from the data storage subsystem a number associated with such name. At step 222, the stored number is played to the user and the Speech Recognition System issues a "Correct" prompt. A test is then made at step 224 to determine if the number is correct. If not, control is returned back to step 212. If the outcome of the test at step 224 is positive, then the Speech Recognition

System responds with a "Dialing" message at step 226. At step 228, the System transfers the MIN and the telephone number to be dialed to the switch for outdialing. The switch dials the telephone number and connects the user to the dialed number at step 230.

Referring now to the Store routine FIGURE 9, a flowchart is shown of a routine used by the subscriber to store telephone numbers for the two digit memory codes, keywords, and directory names to be later dialed. The routine begins in response to receipt of a speaker-independent "Store" command spoken by the user to update the speed-dial list whenever necessary. At step 232, the routine responds to the command with a "Storing" message and engages the speaker-independent recognition subsystem. A test is then made at step 234 to determine whether the user desires to store two digit memory codes. If so, control is transferred to the Memory routine of FIGURE 10. If the outcome of the test at step 234 is negative, a test is made at step 236 to determine whether the user desires to store a Directory name or a number associated with a Directory name. If so, control is transferred to the Directory Storage routine of FIGURE 11. If the outcome of the test at step 236 is negative, then the system will expect to receive a key word for association with the number to be stored at step 238. A test is thus made at step 240 to determine whether the subscriber has spoken a valid key word. If not, the system responds with an error message at step 242

and control is returned to step 234. If the outcome of the test at step 240 is positive, the Speech Recognition System makes an inquiry "Storing (key word), correct" and engages the speaker-independent recognition subsystem at step 244. A test is then made at step 246 to determine if the user selection is correct. If not, the Speech Recognition System issues a "Location, please" prompt at step 248 and returns to step 240. A positive outcome of the test at step 246 causes the system to issue a "Storing" prompt while a number associated with the keyword is stored in the data storage subsystem in step 249. Control is then returned to step 112 in FIGURE 5.

The Memory routine is shown in FIGURE 10. The routine begins at step 250 by inquiring "Which memory" and engages the speaker-independent recognition subsystem. At step 252, a test is made to determine if a two digit memory location number has been collected from the user. A timeout test is then performed at step 254. If timeout occurs, the Speech Recognition System prompts the user to "Please enter next digit" at step 256 and control is returned to step 252. A negative outcome of the timeout test also returns control back to step 252.

A positive outcome of the test at step 252 indicates that the two digit memory code has been collected from the subscriber. At step 258, the Speech Recognition System responds with a message "Storing memory (2 digits), correct" and engages the speaker-independent recognition subsystem. A

test is then made at step 260 to confirm that the subscriber is storing the telephone number in the appropriate location. If not, the Speech Recognition System issues a "Location, please" prompt at step 262 and returns to step 252. A positive outcome of the test at step 260 then causes the routine to test at step 264 whether the memory is already filled up with stored codes. If not, the system issues a "Storing" message and stores the number in the data storage subsystem at step 265. If, however, the response to the test at step 264 is affirmative, the Speech Recognition System issues a "Memory full, erase?" message and engages the speaker-independent recognition subsystem at step 266. A test is then performed at step 268 to determine whether the speaker wishes to erase a memory location. If not, control returns to step 112 in FIGURE 5.

If the subscriber desires to erase a given memory location code, the system issues a "Confirm erase" message at step 270 and engages the speaker-independent recognizer. An erase test is then performed again at step 272 to confirm that the subscriber wishes to erase the specified memory location. A negative outcome of the test at step 272 returns control to step 112 in FIGURE 5. A positive outcome of the erase test at step 272 causes the system to issue an acknowledgment at step 274. Control then returns to step 112 in FIGURE 5.

Referring now to FIGURE 11, a flowchart is shown of the Directory Storage routine. The routine begins at step 276 in

response to a positive response to the Directory inquiry performed in step 236 in FIGURE 9 (i.e., receipt of the Directory command). Step 276 issues a prompt to the subscriber to determine if a "Number in Memory" has been previously associated with a Directory name. A test is then performed at step 278 to determine if the Number in memory has been previously stored. If not, the Speech Recognition System responds by issuing an "Enroll" message and engages the speaker-independent recognition subsystem at step 280. A test is then made at step 282 to determine whether the subscriber wishes to enroll. If not, the routine terminates and returns to step 112 in FIGURE 5.

If the outcome of the test at step 278 is affirmative, the Speech Recognition System issues a message "Re-enroll" and engages the speaker-independent recognition subsystem at step 284. A test is then made at step 286 to determine whether the subscriber wishes to re-enroll the directory name. If yes, or if the outcome of the test at step 282 is positive, the routine continues at step 288 and issues a "Name Please" message and engages the speaker-dependent recognition subsystem. The user then speaks the name a predetermined number (e.g., three (3) times) at step 290 to program the speaker-dependent subsystem. The new directory name and the associated telephone number are then stored in the data storage subsystem in step 292. Control is then returned to step 112 in FIGURE 5.

If the outcome of the test at step 286 is negative, the Speech Recognition System issues a message "Erase" and engages the speaker-independent recognition subsystem at step 296. A test is then made at step 298 to determine whether the subscriber wishes to erase the directory number. If so, the associated number is erased at step 300. Control is then returned to step 112 in FIGURE 5.

It should be appreciated that the specific names of the commands are merely exemplary and should not be taken by way of limitation. Other suitable command names are of course suitable.

As noted above, each cellular telephone is uniquely identified with its MIN and ESN. In the prior art, the service provider operates the MTX 12 and keeps a database of all MIN's (and their associated ESN's). Each time a call is placed by the cellular telephone, the service provider verifies whether the MIN and the associated ESN are authorized. If the MIN and ESN of a cellular phone are not recognized in the switch database, the provider normally allows the call to proceed at least one time. If billing authorization cannot later be verified, however, the MIN and serial number are then placed on an exception list. Subsequent attempts to use the MIN will then be rejected.

Such fraudulent use of the cellular network is ameliorated by the present invention. According to another feature of the invention, the Speech Recognition System also

includes a positive identification function that enables the system under certain circumstances to test whether the user associated with a received MIN (whether in or out of the service area) is an authorized subscriber to the service. For example, after a call is voice-dialed and the Send command is spoken, the system might prompt the caller to answer one or more personal questions. Thus, the caller might be requested to speak the social security and/or account number of the subscriber (purportedly associated with the MIN and ESN). Alternatively, the caller can be prompted to enter such identifying information manually through the telephone keypad. Of course, the nature and scope of the personal information requested by the system depends entirely on the system operator and the degree of security sought by the subscriber and operator.

Such a system could also be used to prevent a local call being placed from a stolen vehicle, for example, i.e., even if the MIN was recognized in the service provider's database. It could also be used to limit access to the voice-dialing function from the subscriber's phone to certain persons. Thus the subscriber may limit his or her children or others from using the phone without the subscriber's knowledge. If the user cannot provide proper answers to such questions, the system rejects the SEND command and the call is terminated. Correct entry of the requested information enables the caller to continue his or her access to the service.

Alternatively the identification function may be implemented in conjunction with a speaker verification function in which the user's identity must first be verified with some spoken predetermined personal identification code. If the verification function is not "convinced" that the person is who he or she claims to be, the identification function is then executed to ask the follow-up questions. One such system is described in copending application Serial No. 07/523,486, filed May 15, 1990, to Hunt et al, titled "Simultaneous Speaker-Independent Voice Recognition And Verification Over A Telephone Network," assigned to the assignee of the present invention.

The present invention has numerous advantages over the prior art. The system combines the use of both speaker-dependent and speaker-independent speech recognition in an mobile or portable telephone communications network environment. Multiple language prompts are spoken from and available simultaneously on multiple ports from a single automated telecommunications-based system. The language selected is based on the language spoken by the user. The system advantageously stores user specific speaker-dependent and speaker-independent speech information with particular user-based addresses.

The invention successfully implements speech recognition in the cellular telephone or personal communications network. Non-wireline networks provide a special challenge to both the

09250800

recognition algorithm developers as well as the applications developers. The recognition algorithm in conjunction with the system application is insensitive to the radio fading, speech clipping, and speech compression conditions that occur in a non-wireline network. In addition, the recognition algorithm accommodates conditions found in the standard switched network. The invention provides a means of accurately recognizing speech that has limited distortion due to clipping or fading and provides a means of reprompting the user for input when the speech has become too distorted for accurate recognition.

Previously, only the best examples of spoken words have been used as tokens for developing speech vocabularies. By collecting speech that has been compressed or that although distorted by radio fading or clipping is still intelligible and by adding this collected speech to the speech training database, the vocabulary based on such data becomes more robust and less sensitive to these conditions. Adding the distorted but intelligible data to the training database of excellent example words allows for a more diverse statistical representation of each vocabulary word. Words that might have been previously rejected, because part of the word was clipped can now be recognized if enough intelligible information is available. If the statistical representation of the word indicates that not enough information is available for

accurate recognition, the recognition system will reject the word and reprompt the user for input.

The invention also enables real-time vocabulary uploading. Previously, speech recognition vocabularies were stored in memory and were not updated or totally changed during the operation of an application. The present invention solves the problem of allowing speech recognition vocabularies to be loaded into a recognition system while an application is in operation. This capability allows for less high speed memory to be used in a system, because an entire set of vocabularies is not required to be resident in memory at one time. This capability also allows for efficient memory management when multiple languages are used, because only the language required by the system user need be resident in memory at any one time. Previously, all possible languages required by users would have been stored in memory simultaneously.

Both continuous and discrete recognition techniques are used in the Speech Recognition System of the present invention.

It should be appreciated by those skilled in the art that the specific embodiments disclosed above may be readily utilized as a basis for modifying or designing other structures for carrying out the same purposes of the present invention. It should also be realized by those skilled in the art that such equivalent constructions do not depart from the spirit and scope of the invention as set forth in the appended claims.

CLAIMS

What is claimed is:

1. In a non-wireline telecommunications system that connects non-wireline telecommunications customers, each having a telephone unit, to land-based customers served by a telephone network, wherein incoming and outgoing calls are routed through a non-wireline telecommunications switching office connected to a group of cell sites that communicate with the telephone units, the improvement comprising a voice recognition system located at the non-wireline telecommunications switching office, the voice recognition system comprising:

a voice recognizer for recognizing characters and commands spoken by a mobile unit customer;

announcing means; and

processor means, operative under the control of a program stored therein and responsive to receipt by the voice recognizer of a first spoken command from said telephone unit customer, for controlling the announcing means to request the telephone unit customer to enter identifying information for directing a telephone call;

the processor means further operative under the control of said program and responsive to receipt by the voice recognizer of a second spoken command from the telephone unit customer, for transferring the identifying information received by the voice recognizer to the non-wireline

telecommunications switching office and for controlling the announcing means to state how the telephone call has been directed.

2. In the non-wireline telecommunications system as described in Claim 1 wherein the voice recognizer includes means for verifying the telephone unit customer's identity.

3. In the non-wireline telecommunications system as described in Claim 1 wherein the identifying information comprises one or more digits of a destination number to be dialed.

4. In the non-wireline telecommunications system as described in Claim 1 wherein the identifying information comprises a keyword associated with a destination number to be dialed.

5. In the non-wireline telecommunications system as described in Claim 1 wherein the identifying information comprises a code associated with a destination number to be dialed.

6. In the non-wireline telecommunications system as described in Claim 1 wherein the processor means is further operative under the control of the program and responsive to receipt by the voice recognizer of a third spoken command from

the telephone unit customer, for controlling the announcing means to announce the identifying information received by the voice recognizer to enable the telephone unit customer to verify the information prior to issuing the second spoken command.

7. In the non-wireline telecommunications system as described in Claim 6 wherein the first spoken command is Dial, the second spoken command is Send and the third spoken command is Verify.

8. A non-wireline telecommunications switching office connected between a telephone network and a group of cell sites that communicate with non-wireline telephone units, comprising:

a non-wireline telephone switching exchange for routing incoming and outgoing calls between the telephone units and land-based customers served by the telephone network;

a voice recognizer for recognizing characters and commands spoken by a mobile unit customer;

announcing means; and

processor means, operative under the control of a program stored therein and responsive to receipt by the voice recognizer of a first spoken command from the telephone unit customer, for controlling the announcing means to request the

telephone unit customer to enter identifying information for directing a telphone call;

the processor means further operative under the control of said program and responsive to receipt by the voice recognizer of a second spoken command from the telephone unit customer, for transferring the identifying information received by the voice recognizer to the non-wireline telecommunications switching office and for controlling the announcing means to state how the telephone call has been directed.

9. A voice recognition system for use in a non-wireline telecommunications switching office connected between a telephone network and a group of cell sites that communicate with non-wireline units, the non-wireline telecommunications switching office including a non-wireline telephone switching exchange for routing incoming and outgoing calls between the non-wireline units and land-based customers served by the telephone network, comprising:

a voice recognizer for recognizing characters and commands spoken by a mobile unit customer;

announcing means; and

processor means, operative under the control of a program stored therein and responsive to receipt by the voice recognizer of a first spoken command from the non-wireline unit customer, for controlling the announcing means to request

the non-wireline unit customer to enter identifying information for directing a telephone call;

the processor means further operative under the control of said program and responsive to receipt by the voice recognizer of a second spoken command from the non-wireline unit customer, for controlling the announcing means to prompt the non-wireline unit customer to answer a question uniquely associated with an authorized user of the non-wireline unit; and

wherein the processor means is further operative under the control of said program and responsive to receipt of a correct answer to the question for transferring the identifying information received by the voice recognizer to the non-wireline telecommunications switching office for subsequent action.

SPEECH RECOGNITION SYSTEM FOR ELECTRONIC SWITCHES
IN A NON-WIRELINE COMMUNICATIONS NETWORK

ABSTRACT OF THE DISCLOSURE

An advanced telecommunications system is provided for the recognizing of spoken commands over a cellular telephone, satellite telephone, or personal communications network. In the cellular application, for example, a Speech Recognition System interconnects either internally with or as an external peripheral to a cellular telecommunications switch. The Speech Recognition System includes an administrative subsystem, a call processing subsystem, a speaker-dependent recognition subsystem, a speaker-independent recognition subsystem, and a data storage subsystem. The Speech Recognition System also allows for increased efficiency in the cellular telephone network by integrating with the switch or switches as a shared resource. The administrative subsystem of the Speech Recognition System is used to keep statistical logs of pertinent call information. Pre-recorded instructional messages are stored in the memory of the call processing subsystem for instructing a user on his or her progress in using the system. The speaker-independent recognition subsystem allows the user to interact with the system employing non-user specific functions. User specific functions are controlled with the speaker-dependent recognition subsystem. User specific attributes collected by the recognition subsystems are stored in the data storage subsystem.

DOCKET NO. 54940000

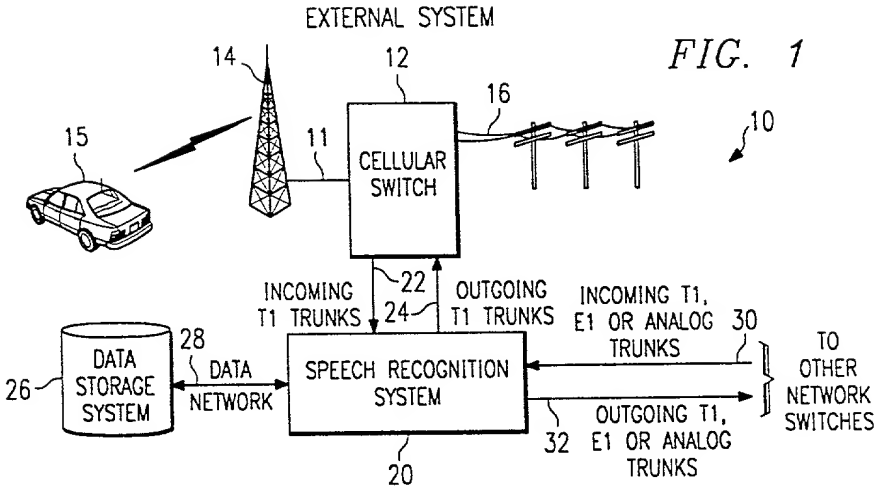
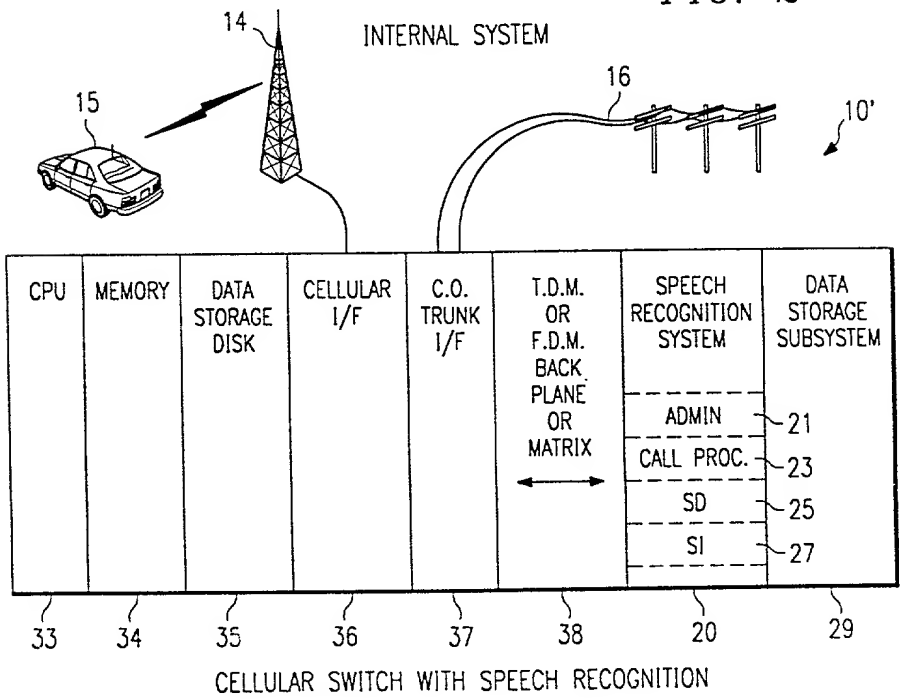


FIG. 1

FIG. 2

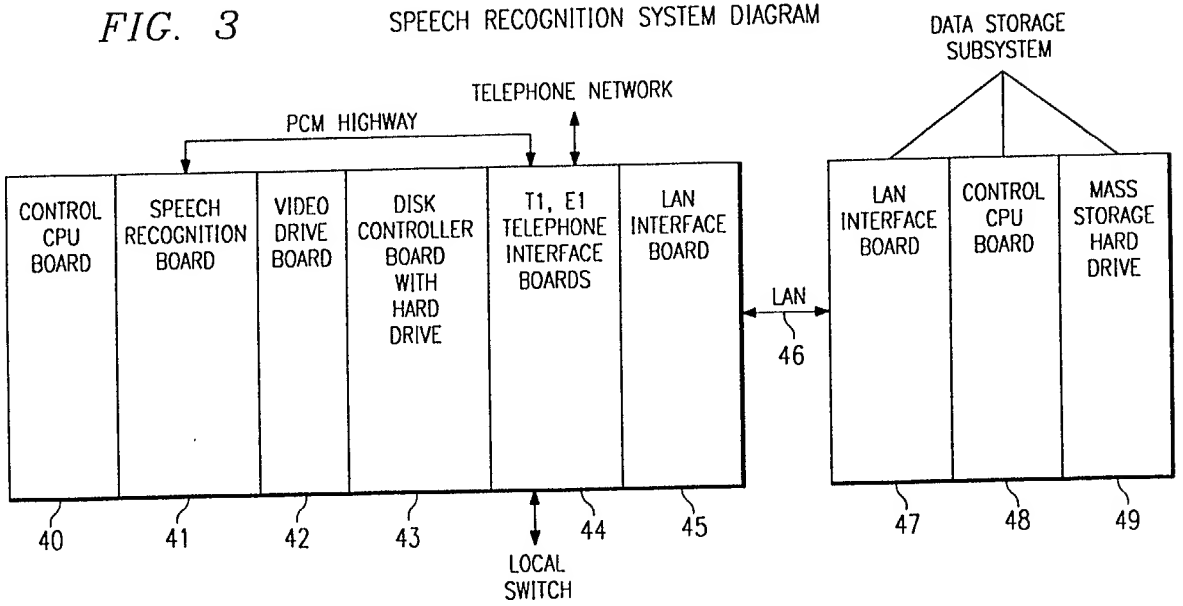


CELLULAR SWITCH WITH SPEECH RECOGNITION

09/26/2000 14:36 FAX 2026

0021FF "0782260

FIG. 3



0027T*0T822760

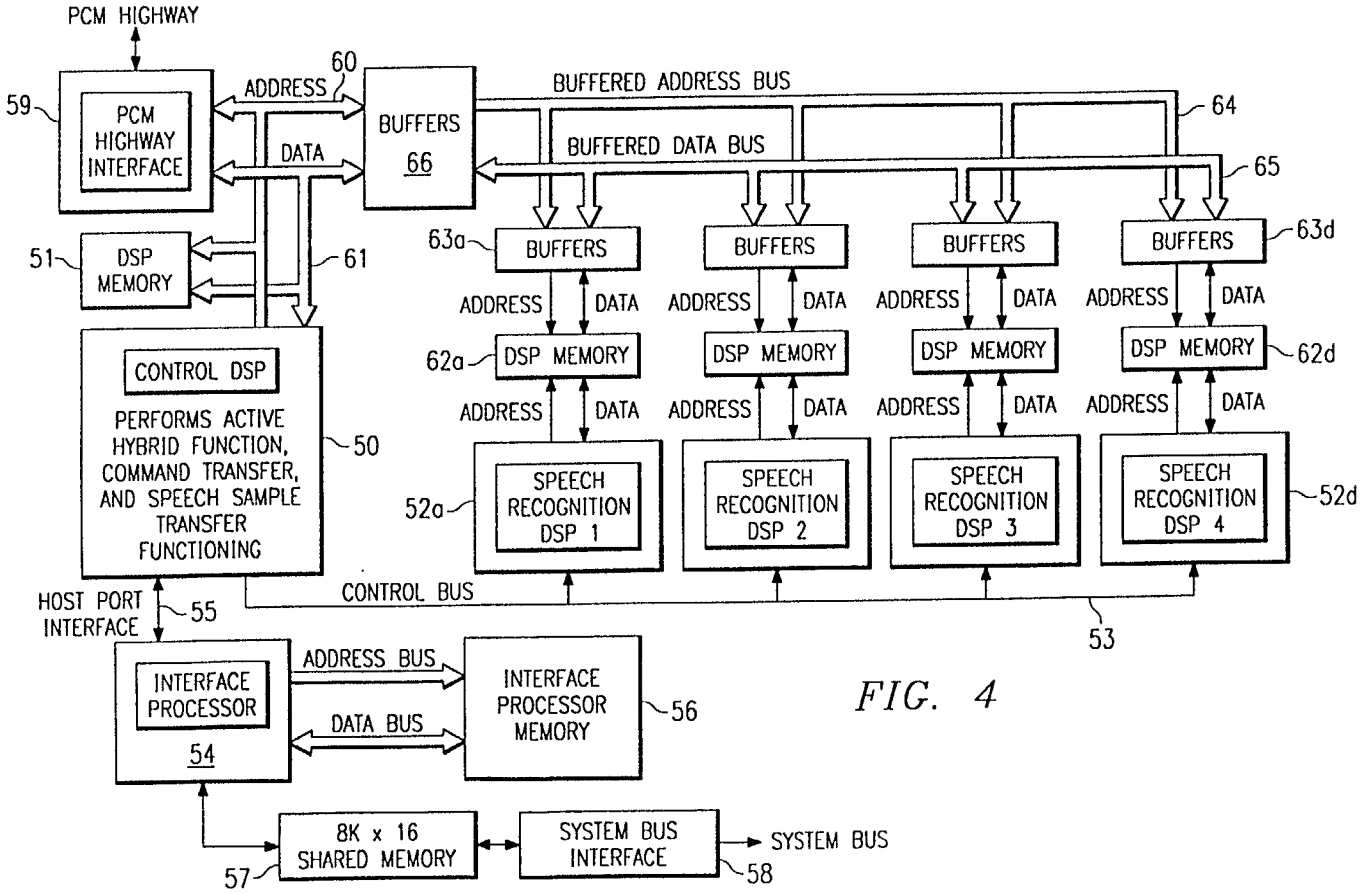


FIG. 4

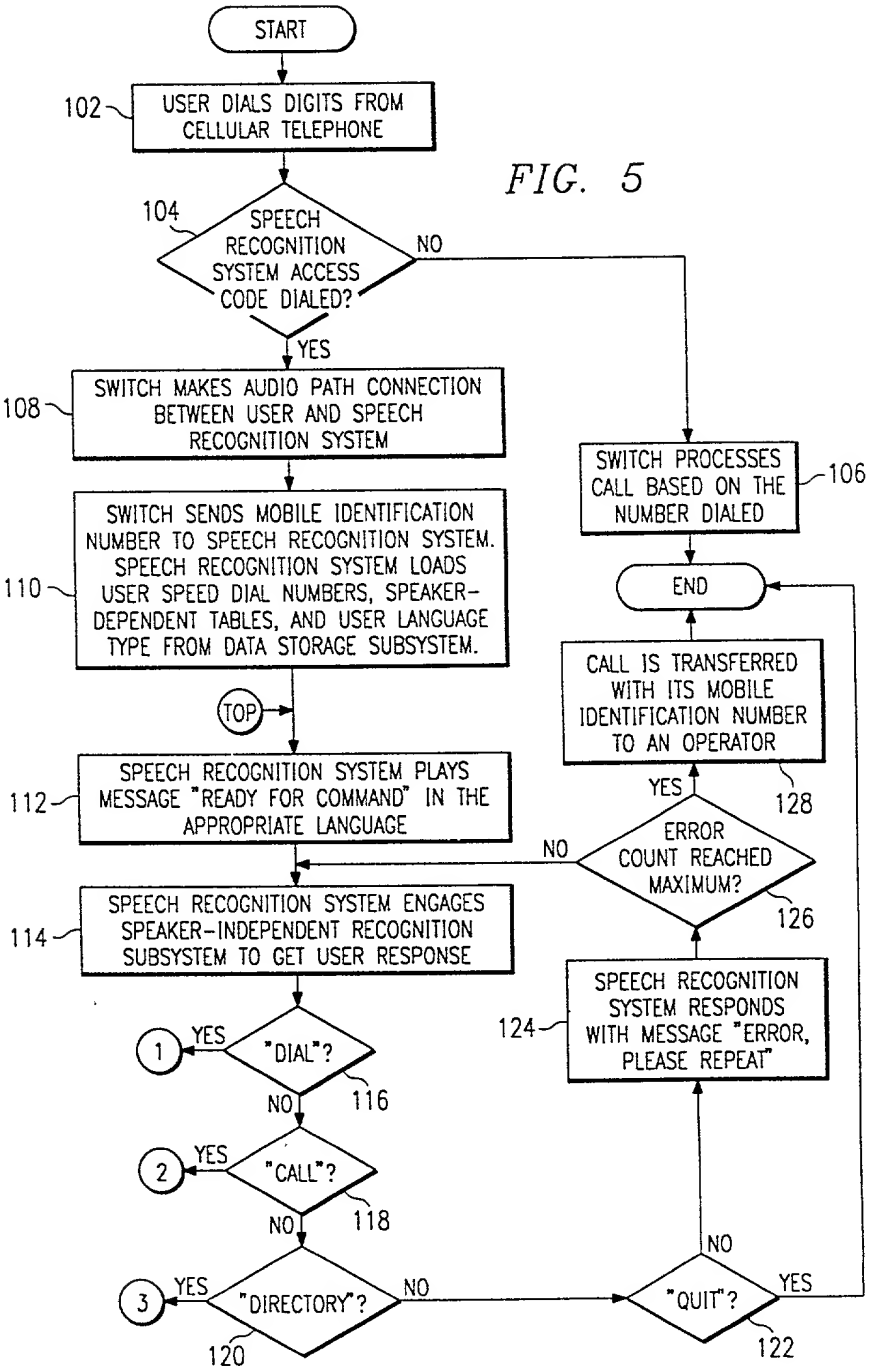


FIG. 5

09/09/2003, EAST Version: 1.03.0002

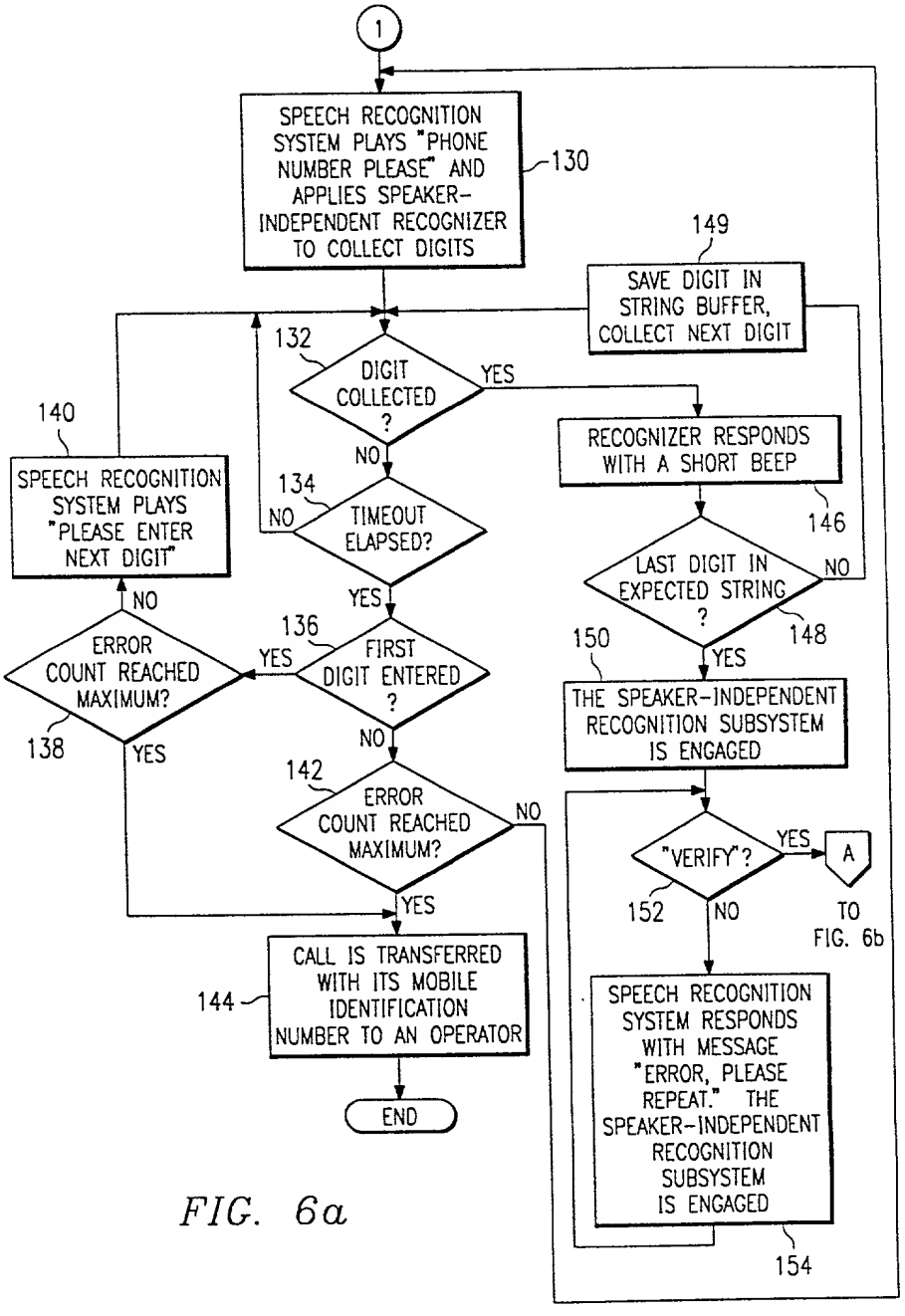

1
SPEECH RECOGNITION SYSTEM PLAYS "PHONE NUMBER PLEASE" AND APPLIES SPEAKER-INDEPENDENT RECOGNIZER TO COLLECT DIGITS
130
149
SAVE DIGIT IN STRING BUFFER, COLLECT NEXT DIGIT
132
DIGIT COLLECTED ?
YES
NO
RECOGNIZER RESPONDS WITH A SHORT BEEP
146
140
SPEECH RECOGNITION SYSTEM PLAYS "PLEASE ENTER NEXT DIGIT"
134
NO
TIMEOUT ELAPSED?
YES
LAST DIGIT IN EXPECTED STRING ?
NO
148
YES
150
NO
ERROR COUNT REACHED MAXIMUM?
136
YES
FIRST DIGIT ENTERED ?
NO
138
YES
THE SPEAKER-INDEPENDENT RECOGNITION SUBSYSTEM IS ENGAGED
142
ERROR COUNT REACHED MAXIMUM?
NO
"VERIFY"?
YES
A
152
NO
TO FIG. 6b
YES
CALL IS TRANSFERRED WITH ITS MOBILE IDENTIFICATION NUMBER TO AN OPERATOR
144
SPEECH RECOGNITION SYSTEM RESPONDS WITH MESSAGE "ERROR, PLEASE REPEAT." THE SPEAKER-INDEPENDENT RECOGNITION SUBSYSTEM IS ENGAGED
154
END

FIG. 6a

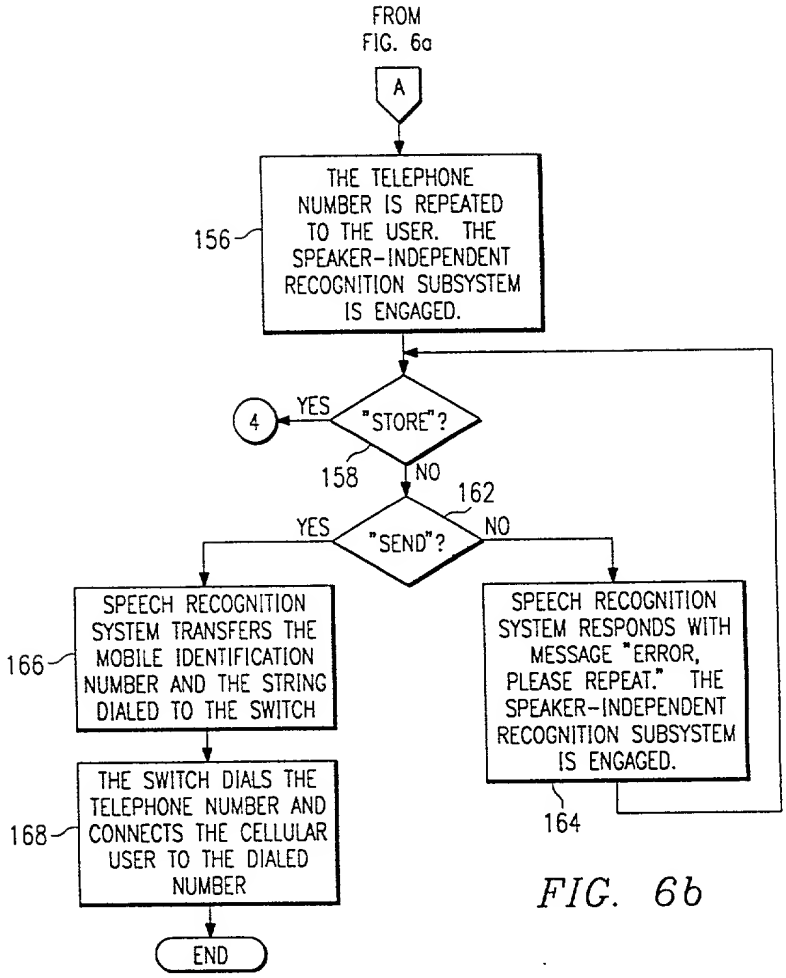

FROM
FIG. 6a
A
THE TELEPHONE NUMBER IS REPEATED TO THE USER. THE SPEAKER-INDEPENDENT RECOGNITION SUBSYSTEM IS ENGAGED.
156
4
YES
"STORE"?
158
NO
162
YES
"SEND"?
NO
SPEECH RECOGNITION SYSTEM TRANSFERS THE MOBILE IDENTIFICATION NUMBER AND THE STRING DIALED TO THE SWITCH
166
THE SWITCH DIALS THE TELEPHONE NUMBER AND CONNECTS THE CELLULAR USER TO THE DIALED NUMBER
168
END
SPEECH RECOGNITION SYSTEM RESPONDS WITH MESSAGE "ERROR, PLEASE REPEAT." THE SPEAKER-INDEPENDENT RECOGNITION SUBSYSTEM IS ENGAGED.
164

FIG. 6b

FIG. 7a

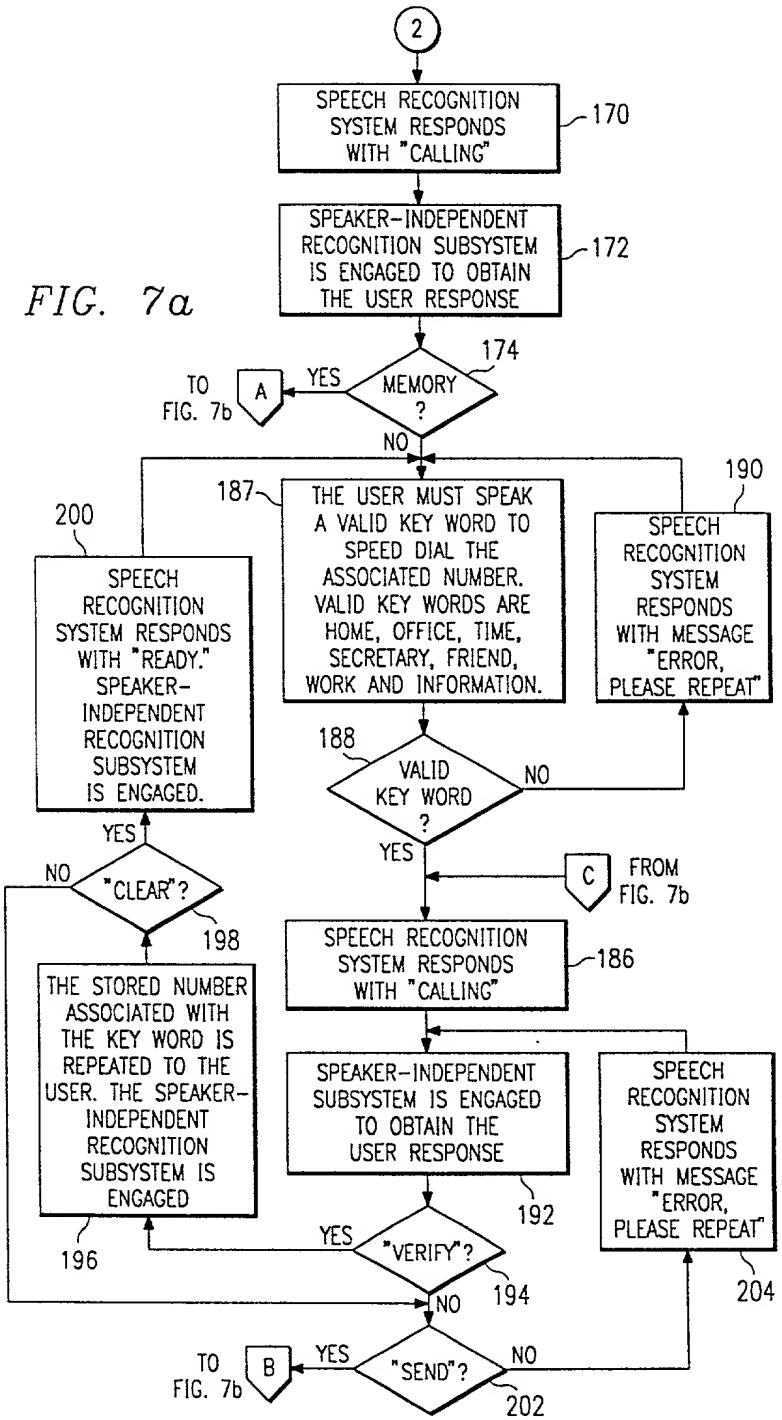
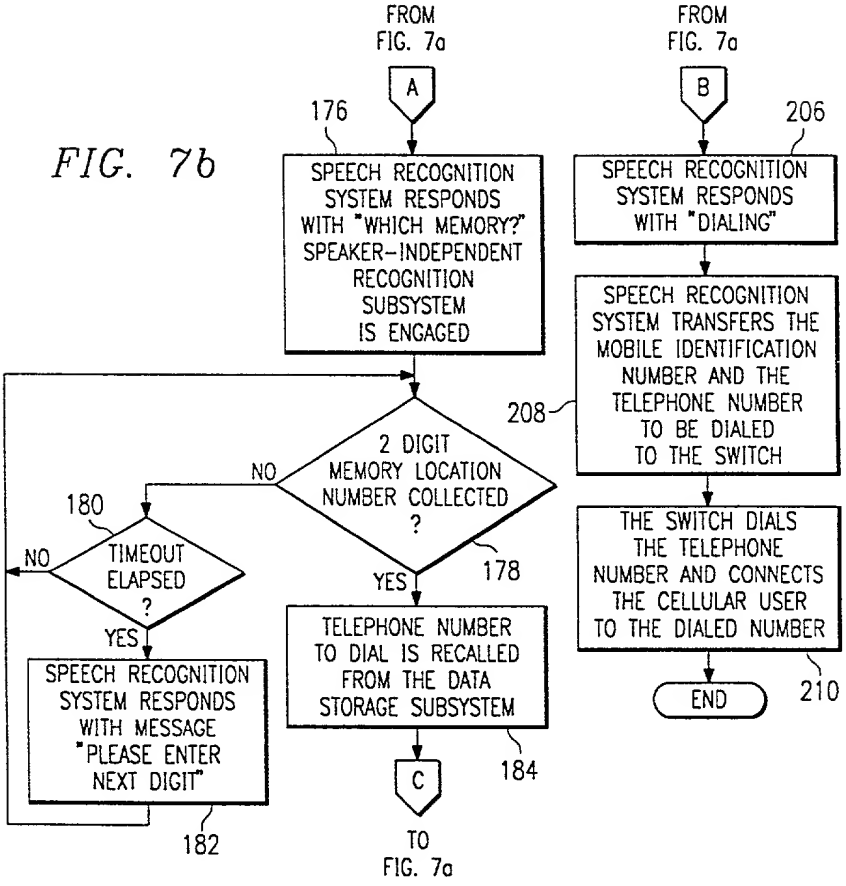

2
SPEECH RECOGNITION SYSTEM RESPONDS WITH "CALLING"
170
SPEAKER-INDEPENDENT RECOGNITION SUBSYSTEM IS ENGAGED TO OBTAIN THE USER RESPONSE
172
174
MEMORY ?
YES
TO FIG. 7b
A
NO
190
187
THE USER MUST SPEAK A VALID KEY WORD TO SPEED DIAL THE ASSOCIATED NUMBER. VALID KEY WORDS ARE HOME, OFFICE, TIME, SECRETARY, FRIEND, WORK AND INFORMATION.
SPEECH RECOGNITION SYSTEM RESPONDS WITH MESSAGE "ERROR, PLEASE REPEAT"
200
SPEECH RECOGNITION SYSTEM RESPONDS WITH "READY." SPEAKER-INDEPENDENT RECOGNITION SUBSYSTEM IS ENGAGED.
188
VALID KEY WORD ?
NO
YES
C
FROM FIG. 7b
SPEECH RECOGNITION SYSTEM RESPONDS WITH "CALLING"
186
YES
"CLEAR"?
NO
198
THE STORED NUMBER ASSOCIATED WITH THE KEY WORD IS REPEATED TO THE USER. THE SPEAKER-INDEPENDENT RECOGNITION SUBSYSTEM IS ENGAGED
SPEAKER-INDEPENDENT SUBSYSTEM IS ENGAGED TO OBTAIN THE USER RESPONSE
192
SPEECH RECOGNITION SYSTEM RESPONDS WITH MESSAGE "ERROR, PLEASE REPEAT"
204
196
YES
"VERIFY"?
194
NO
TO FIG. 7b
B
YES
"SEND"?
NO
202

FIG. 7b


FROM FIG. 7a
A
176
SPEECH RECOGNITION SYSTEM RESPONDS WITH "WHICH MEMORY?" SPEAKER-INDEPENDENT RECOGNITION SUBSYSTEM IS ENGAGED
2 DIGIT MEMORY LOCATION NUMBER COLLECTED ?
NO
YES
178
180
TIMEOUT ELAPSED ?
NO
YES
SPEECH RECOGNITION SYSTEM RESPONDS WITH MESSAGE "PLEASE ENTER NEXT DIGIT"
182
TELEPHONE NUMBER TO DIAL IS RECALLED FROM THE DATA STORAGE SUBSYSTEM
184
C
TO FIG. 7a
FROM FIG. 7a
B
206
SPEECH RECOGNITION SYSTEM RESPONDS WITH "DIALING"
208
SPEECH RECOGNITION SYSTEM TRANSFERS THE MOBILE IDENTIFICATION NUMBER AND THE TELEPHONE NUMBER TO BE DIALED TO THE SWITCH
THE SWITCH DIALS THE TELEPHONE NUMBER AND CONNECTS THE CELLULAR USER TO THE DIALED NUMBER
END
210

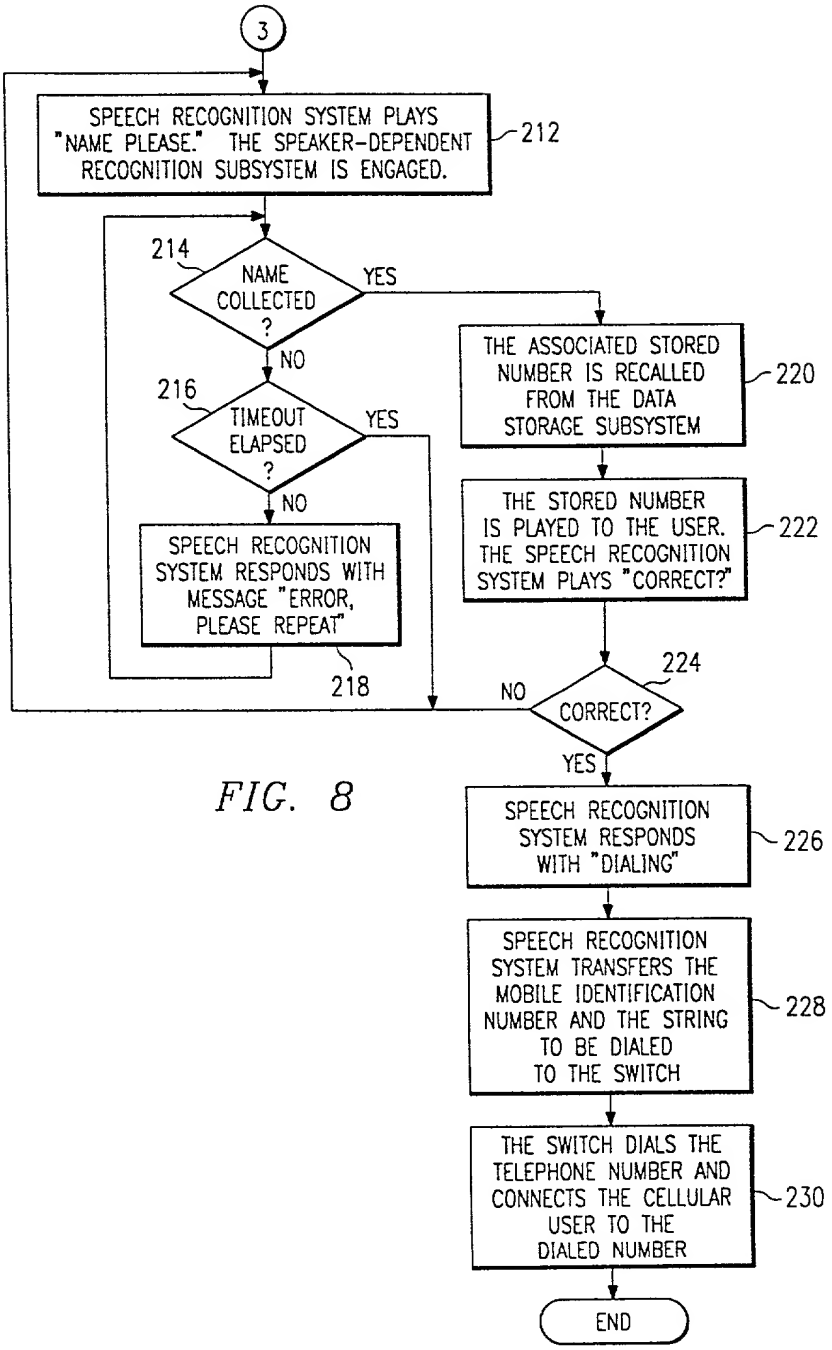

3
SPEECH RECOGNITION SYSTEM PLAYS "NAME PLEASE." THE SPEAKER-DEPENDENT RECOGNITION SUBSYSTEM IS ENGAGED.
212
214
NAME COLLECTED ?
YES
NO
216
TIMEOUT ELAPSED ?
YES
NO
SPEECH RECOGNITION SYSTEM RESPONDS WITH MESSAGE "ERROR, PLEASE REPEAT"
218
THE ASSOCIATED STORED NUMBER IS RECALLED FROM THE DATA STORAGE SUBSYSTEM
220
THE STORED NUMBER IS PLAYED TO THE USER. THE SPEECH RECOGNITION SYSTEM PLAYS "CORRECT?"
222
224
CORRECT?
NO
YES
SPEECH RECOGNITION SYSTEM RESPONDS WITH "DIALING"
226
SPEECH RECOGNITION SYSTEM TRANSFERS THE MOBILE IDENTIFICATION NUMBER AND THE STRING TO BE DIALED TO THE SWITCH
228
THE SWITCH DIALS THE TELEPHONE NUMBER AND CONNECTS THE CELLULAR USER TO THE DIALED NUMBER
230
END

FIG. 8

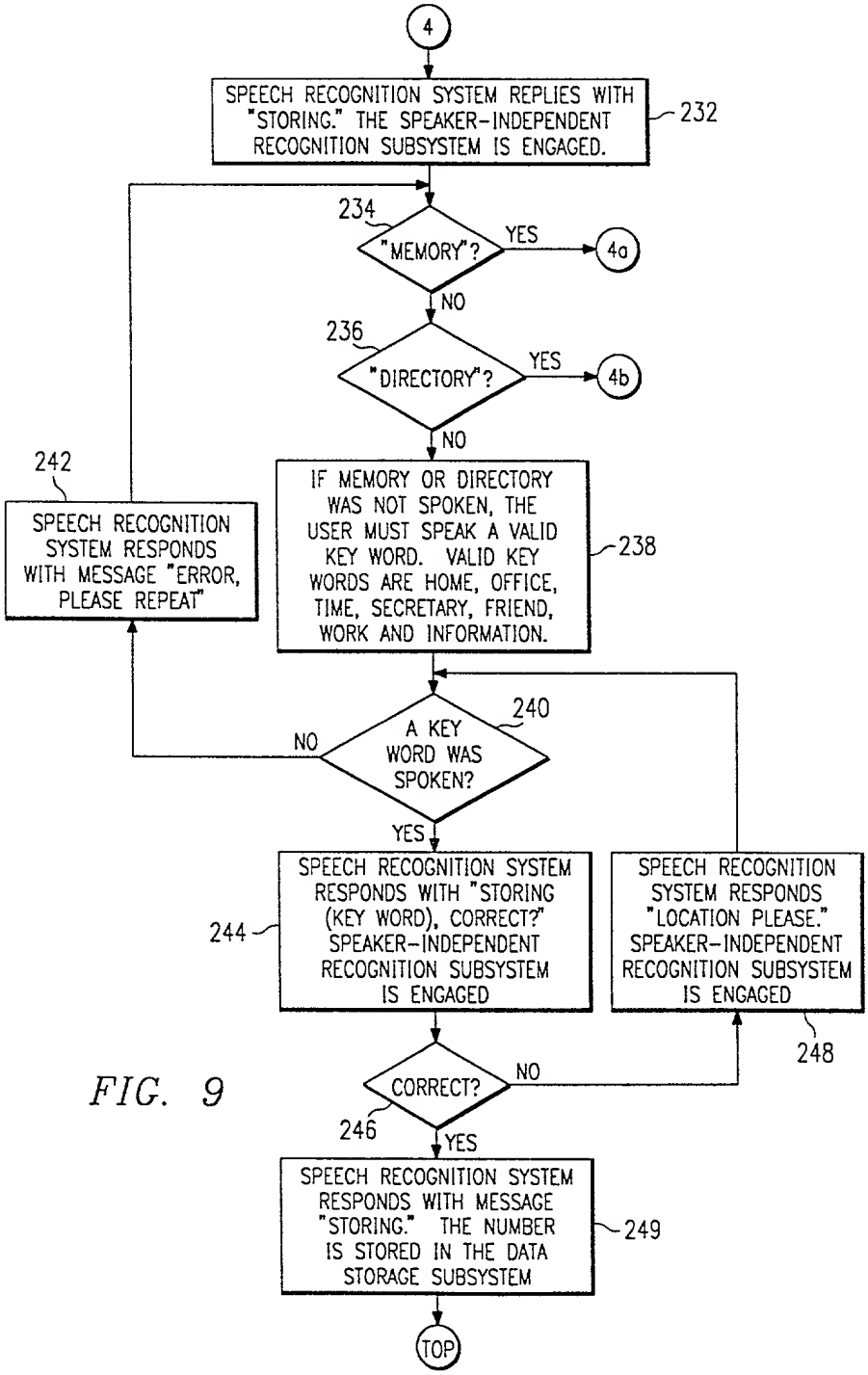


FIG. 9

09/25/2003, EAST Version: 1.03.0002

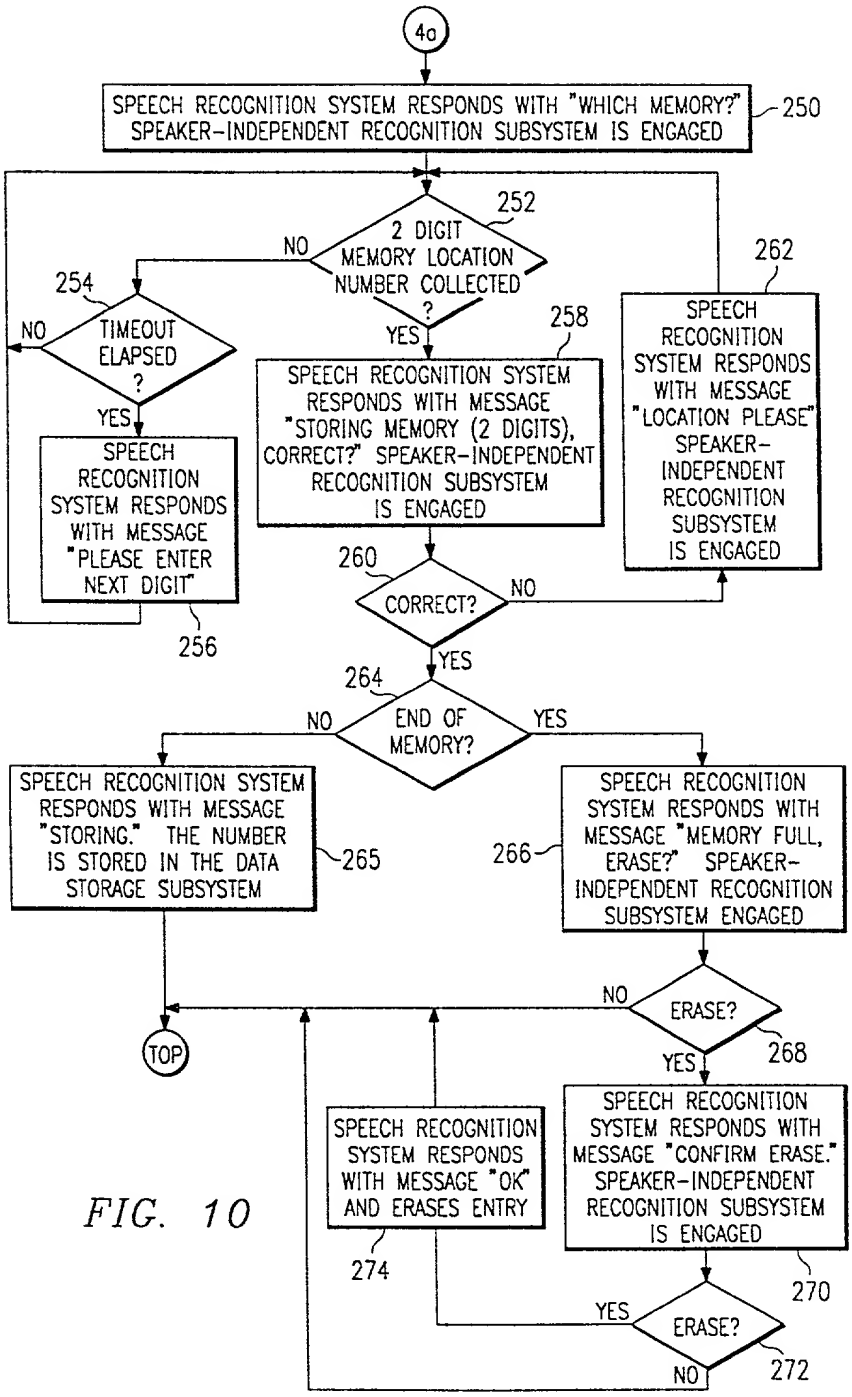


FIG. 10

09/24/2004 DOCKET

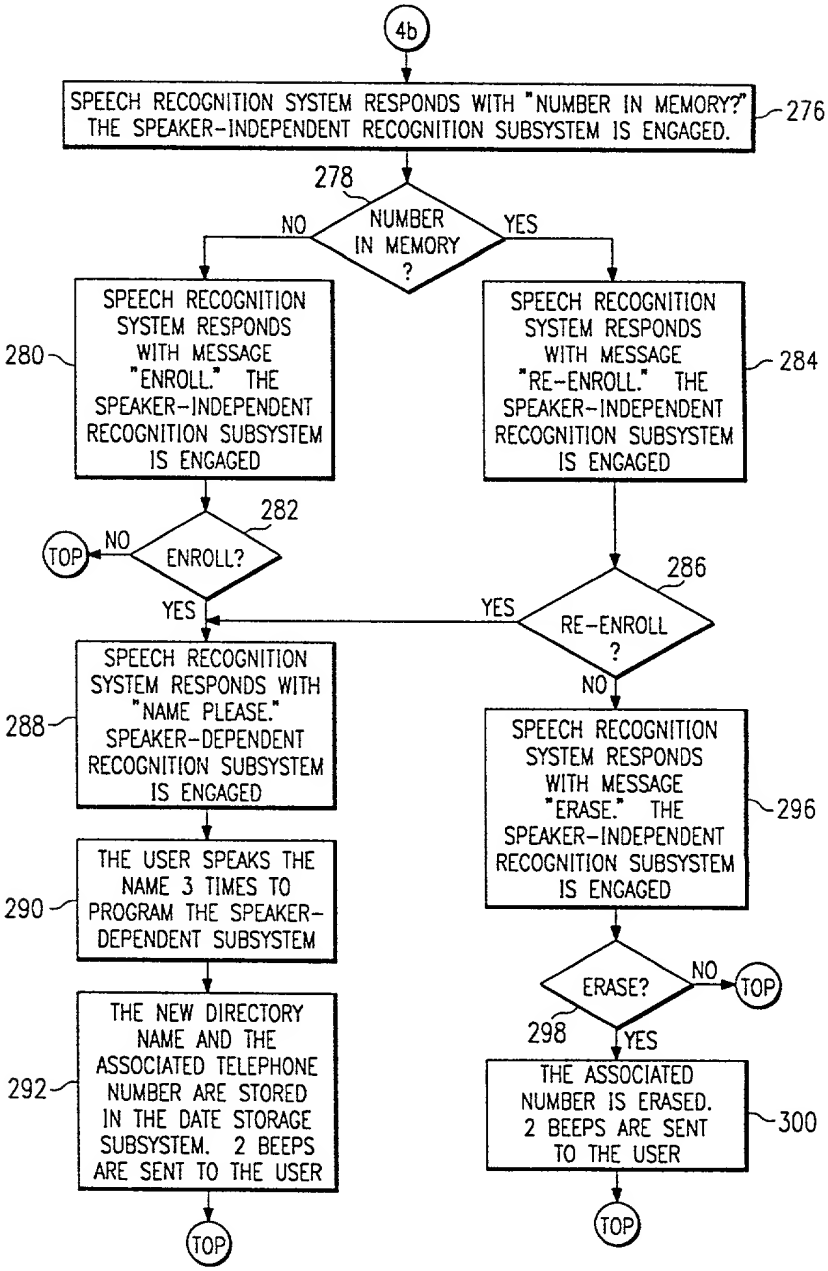

4b
SPEECH RECOGNITION SYSTEM RESPONDS WITH "NUMBER IN MEMORY?" THE SPEAKER-INDEPENDENT RECOGNITION SUBSYSTEM IS ENGAGED.
276
278
NUMBER IN MEMORY ?
NO
YES
SPEECH RECOGNITION SYSTEM RESPONDS WITH MESSAGE "ENROLL." THE SPEAKER-INDEPENDENT RECOGNITION SUBSYSTEM IS ENGAGED
280
SPEECH RECOGNITION SYSTEM RESPONDS WITH MESSAGE "RE-ENROLL." THE SPEAKER-INDEPENDENT RECOGNITION SUBSYSTEM IS ENGAGED
284
282
ENROLL?
NO
TOP
YES
286
RE-ENROLL ?
YES
NO
SPEECH RECOGNITION SYSTEM RESPONDS WITH "NAME PLEASE." SPEAKER-DEPENDENT RECOGNITION SUBSYSTEM IS ENGAGED
288
THE USER SPEAKS THE NAME 3 TIMES TO PROGRAM THE SPEAKER-DEPENDENT SUBSYSTEM
290
THE NEW DIRECTORY NAME AND THE ASSOCIATED TELEPHONE NUMBER ARE STORED IN THE DATE STORAGE SUBSYSTEM. 2 BEEPS ARE SENT TO THE USER
292
TOP
SPEECH RECOGNITION SYSTEM RESPONDS WITH MESSAGE "ERASE." THE SPEAKER-INDEPENDENT RECOGNITION SUBSYSTEM IS ENGAGED
296
ERASE?
NO
TOP
298
YES
THE ASSOCIATED NUMBER IS ERASED. 2 BEEPS ARE SENT TO THE USER
300
TOP

FIG. 11

DECLARATION AND POWER OF ATTORNEY

We, Bernard F. Bareis, Peter J. Foster and Thomas B. Schalk, declare that we are citizens of The United States of America residing at 6844 Shadybrook Lane, Apartment 2052, Dallas, Texas 75231, 3924 Bryn Mawr, Dallas, Texas 75225 and 10140 Cimmaron Trail, Dallas, Texas 75243, respectively; that we believe we are the original, first and sole inventors of the subject matter which is claimed and for which a patent is sought on the invention, design or discovery entitled **SPEECH RECOGNITION SYSTEM FOR ELECTRONIC SWITCHES IN A NON WIRELINE COMMUNICATIONS NETWORK**, the application of which was filed March 22, 1994, U.S. Serial No. 08/216,009, which application is a continuation of copending application U.S. Serial No. 07/867,873 filed April 13, 1992, now U.S. Patent No. 5,297,183; that we have reviewed and understand the contents of the above-identified application, including the claims; that we do not know and do not believe that said invention, design or discovery was ever known or used in the United States of America before our invention or discovery thereof, or patented or described in any printed publication in any country before our invention or discovery thereof, or more than one year prior to this application, or in public use or on sale in the United States of American more than one year prior to this application; that said invention, design or discovery has not been patented or made the subject of an inventor's certificate issued prior to the date of this application in any country foreign to the United States of America on an application filed by us or our legal representatives or assigns; and that we acknowledge our duty to disclose to the United States Patent and Trademark Office all information known to us to be material to patentability as defined in 37 C.F.R. §1.56(a).

We hereby appoint:

David H. Judson, Reg. No. 30,467

of the firm of Hughes & Luce, L.L.P. our attorneys with full power of substitution and revocation, to prosecute this application and to transact all business in the United States Patent and Trademark Office connected therewith, and to file and prosecute any international patent application filed thereon before any international authorities under the Patent Cooperation Treaty.

Please address all correspondence as follows:

David H. Judson
Hughes & Luce, L.L.P.
1717 Main Street
Suite 2800
Dallas, Texas 75201

Docket No. 28,965

and direct all telephone calls to David H. Judson at (214) 939-5672.

We hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

(Inventor's Signature)

Bernard F. Bareis
(Full Name of Inventor)

6844 Shadybrook Lane
Apartment 2052
Dallas, Texas 75231
(Post Office Address)

05/11/94
(Date)

(Inventor's Signature)

Thomas B. Schalk
(Full Name of Inventor)

10140 Cimmaron Trail
Dallas, Texas 75243
(Post Office Address)

11 May 94
(Date)

(Inventor's Signature)

Peter J. Foster
(Full Name of Inventor)

3924 Bryn Mawr
Dallas, Texas 75225
(Post Office Address)

(Date)

54940000:128

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of | Atty. Docket

BAREIS ET AL | PHA 23,944X

Serial No. | Group Art Unit:

Filed: CONCURRENTLY | Examiner:

Title: SPEECH RECOGNITION SYSTEM FOR ELECTRONIC SWITCHES IN A NON-WIRELINE COMMUNICATIONS NETWORK

Honorable Commissioner for Patents
Washington, D.C. 20231

APPOINTMENT OF ASSOCIATES

Sir:

The undersigned Attorney of Record hereby revokes all prior appointments (if any) of Associate Attorney(s) or Agent(s) in the above-captioned case and appoints:

Tony Piotrowski (Registration No. 42,080)
(Registration No.) and
(Registration No.)

c/o U.S. PHILIPS CORPORATION, Intellectual Property Department, 580 White Plains Road, Tarrytown, New York 10591, his Associate Attorney(s)/Agent(s) with all the usual powers to prosecute the above-identified application and any division or continuation thereof, to make alterations and amendments therein, and to transact all business in the Patent and Trademark Office connected therewith.

ALL CORRESPONDENCE CONCERNING THIS APPLICATION AND THE LETTERS PATENT WHEN GRANTED SHOULD BE ADDRESSED TO THE UNDERSIGNED ATTORNEY OF RECORD.

Respectfully,

Jack E. Haken, Reg. 26,902
Attorney of Record

Dated at Tarrytown, New York
this November 27, 2000

s:\pi\ma27pid0.wa0.doc

09/724,208 11/28/2000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of | Atty. Docket

BERNARD F. BAREIS ET AL | PHA 23,944W

Serial No. 08/914,440 | Group Art Unit: 2616

Filed: AUGUST 19, 1997 | Examiner:

Title: SPEECH RECOGNITION SYSTEM FOR ELECTRONIC SWITCHES IN A NON-WIRELINE COMMUNICATIONS NETWORK

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

REQUEST UNDER 37 C.F.R. 3.73 TO PROCEED IN THE NAME OF ASSIGNEE AND POWER OF ATTORNEY

Sir:

The assignee hereby requests that prosecution of this application proceed in the name of assignee.

Pursuant to merger agreements dated June 28, 1999, filed concurrently herewith (see Form PTO 1595 and U.S. patent applications identified in Appendix A therein) the above-identified application has been transferred by Voice Control Systems (and the related companies e.g. Vulcan Merger Sub, Inc.) to Philips Electronics North America Corporation. Accordingly, assignee has provided a showing of the chain of title (ultimately leading to ownership by Philips Electronics North America Corporation), between Voice Control Systems and Philips Electronics North America Corporation.

Therefore it is respectfully requested that based on this showing, Philips Electronics North America Corporation be recognized as the assignee of the entire right, title and interest of the above-identified application.

As the assignee, Philips Electronics North America Corporation, hereby revokes all previous powers of attorney in this application and appoints the following as its attorneys of record:

Algy Tamoshunas, Reg. 27,677;

Jack E. Haken, Reg. 26,902.

Please note that assignee is not a small entity.

Respectfully submitted,

By _____
Algy Tamoshunas, Reg. 27,677
Vice-President
(914) 333-9600

CERTIFICATE OF MAILING

It is hereby certified that this correspondence is being deposited with the United States Postal Service as first-class mail in an envelope addressed to:

COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

On May 2, 2000

By Josephine Cangelosi

09525450 - 050200